

NOISE MONITORING IN CNC MACHINE WORKING AREA IN ELECTRONIC BASED COMPANY IN KUANTAN, MALAYSIA

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Dedicated to my beloved parents

SALLEH BIN HASSAN
ROBIAH BINTI AWANG

and

My supervisors

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ABSTRACT

Noise is the most significant health hazard to the working population in terms of the number of people affected has been recognized by the World Health Organization (WHO). The noise induced hearing loss is the most cases damage accumulates over time. Therefore, the goal of noise control regulation for company TT Electronics is not more than 85 dB (A). In this project, the noise level monitoring is important to do as the result from the Audiometric Test for the employees exposed to the noise is has been made. There are 15 machines involved at the CNC Machine area with a different type of process and model of machines that will affect the noise level. The Sound Level Meter (SLM) is use as the instrument to measure the noise level in dB (A) along with the software SE323 that can analyst from the noise level from the SLM. In SE323, the average of the noise level can be seen in certain time and it is easier to use. There are few spot of noise indicates the high noise level through the experiment. The noise level can exceed to more than 100 dB (A). The cause of the noise level at this spot is because of the leakage which is pneumatic pressure, stripping process and others. The noise level at the idle time is 53.21 dB (A) with the effect of air conditioner and others but not from the machine. Furthermore, the noise level at the different distance from the SLM to the source of noise is quite low compared to the noise level at the source of noise with the difference 0.6 dB (A). Thus, the shorter the distance an employee from the source of noise, the higher the noise level. In addition, the noise average at the technician point is 94.71 dB (A) for the 8 hour shift. Hence, the noise level regulations at this company are compared to the noise level regulation of OSHA and it shows that noise level at this company is exceeding the noise level regulation of OSHA. Consequently, the noise control should be implementing to prevent the more problem to employee especially of hearing loss.

ABSTRAK

Bunyi bising sangat bahaya terhadap kesihatan yang paling ketara kepada populasi yang bekerja dari segi bilangan orang yang terjejas telah diiktiraf oleh Pertubuhan Kesihatan Sedunia (WHO). Bunyi bising merupakan kes kerosakan terkumpul dari masa ke masa. Oleh itu, matlamat peraturan kawalan bunyi untuk syarikat TT elektronik adalah tidak melebihi 85 dB (A). Dalam projek ini, pemantauan paras bunyi adalah penting untuk dilakukan kerana hasil daripada Ujian Audiometric untuk pekerja yang terdedah kepada bunyi bising sudah dilakukan. Terdapat 15 mesin yang terlibat di kawasan Mesin CNC dengan jenis yang berbeza daripada proses dan model mesin yang akan mempengaruhi tahap bunyi. *The Sound Level Meter* (SLM) yang digunakan sebagai alat untuk mengukur tahap bunyi dalam dB (A) bersama-sama dengan perisian SE323 yang boleh menganalisis tahap bunyi dari SLM. Dalam SE323, purata paras bunyi yang boleh dilihat dalam masa tertentu dan ia adalah lebih mudah untuk digunakan. Terdapat beberapa sumber tempat bunyi menunjukkan tahap bunyi yang tinggi. Tahap bunyi bising boleh melebihi lebih daripada 100 dB (A). Punca tahap bunyi di tempat ini adalah kerana kebocoran daripada tekanan pneumatik, proses pelucutan dan lain-lain. Tahap bunyi bising pada masa terbiar 53.21 dB (A) kerana kesan daripada penghawa dingin dan lain-lain tetapi tidak dari mesin. Tambahan pula, tahap bunyi pada jarak yang berbeza dari SLM kepada sumber bunyi adalah agak rendah berbanding dengan paras bunyi pada sumber bunyi dengan perbezaan 0.6 dB (A). Oleh itu, lebih dekat jarak pekerja dengan sumber bunyi, lebih tinggi tahap bunyi. Di samping itu, purata bunyi pada titik juruteknik adalah 94.71 dB (A) bagi 8 jam *shift*. Oleh itu, peraturan-peraturan tahap bunyi di syarikat ini dibandingkan dengan pengawalseliaan tahap bunyi OSHA dan ia menunjukkan bahawa tahap bunyi di syarikat ini melebihi peraturan tahap bunyi OSHA. Oleh itu, kawalan bunyi bising perlu dilaksanakan bagi mengelakkan masalah yang lebih kepada pekerja terutama kehilangan pendengaran.

TABLE OF CONTENTS

SUPERVISOR'S DECLARATION	iii
STUDENT'S DECLARATION	iv
ACKNOWLEDGEMENTS	vi
ABSTRACT	vii
ABSTRAK	viii
TABLE OF CONTENTS	ix
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF SYMBOLS	xiv
LIST OF ABBREVIATIONS	xv
CHAPTER 1	1
1.1 PROJECT BACKGROUND	1
1.2 PROBLEM STATEMENT	3
1.3 OBJECTIVE	3
1.4 SCOPE OF THE STUDY	4
1.5 FLOW CHART	4
CHAPTER 2	7
2.1 INTRODUCTION	7
2.2 SOUND	7
2.2.1 Sound Pressure	7
2.2.2 Sound Power	10
2.2.3 Sound Intensity	11
2.3 CHARACTERISTIC OF SOUND	13
2.3.1 Frequency	13
2.3.2 Wavelength	13
2.3.3 Longitudinal Wave	14
2.3.4 Beat Frequency	15
2.4 A-WEIGHTED DECIBEL	15
2.5 BANDWIDTH	17
2.6 NOISE	18
2.6.1 Effect of Noise	19
2.7 SOURCE OF NOISE	20

2.8	NOISE MEASUREMENT.....	20
2.9	INSTRUMENT SELECTION	20
2.9.1	Guidelines for Instrument Selection	21
2.10	SOUND LEVEL METER.....	22
2.11	NOISE REGULATION AND STANDARDS.....	23
2.11.1	Permissible Exposure Limits	24
2.11.2	Legal Requirement of Noise	25
2.12	SUMMARY	25
CHAPTER 3	.....	27
3.1	INTRODUCTION.....	27
3.2	NOISE MONITORING AT TT ELECTRONICS	27
3.3	EQUIPMENTS USED	28
3.4	SOURCE OF NOISE	31
3.5	NOISE LEVEL MONITORING.....	33
3.6	CALCULATION	37
3.7	SUMMARY	39
CHAPTER 4	.....	40
4.1	INTRODUCTION.....	40
4.2	NOISE LEVEL OF SOURCE OF NOISE WITHOUT MACHINE OPERATION.....	40
4.3	NOISE LEVEL AT SOURCE OF NOISE AT CERTAIN OPERATION TIME	43
4.4	NOISE LEVEL AT IDLE CONDITION.....	51
4.5	NOISE LEVEL FROM THE SOURCE OF NOISE (25CM).....	54
4.6	NOISE LEVEL FROM THE SOURCE OF NOISE (5CM).....	58
4.7	NOISE LEVEL AT THE TECHNICIAN POINT	62
4.8	TIME WEIGHTED AVERAGE (TWA) CALCULATION.....	65
4.9	DISCUSSION	66
4.10	SUMMARY	67
CHAPTER 5	.....	68
5.1	INTRODUCTION.....	68
5.2	CONCLUSIONS	68
5.3	RECOMMENDATIONS	70
CHAPTER 6	REFERENCES.....	71
APPENDIX A	.....	73
APPENDIX B	.....	75

LIST OF TABLES

Table 1.1 Gantt Chart for project.....	6
Table 2.1 Typical Noise Level measurement from different noise source	17
Table 2.2 Guidelines for Instrument Selection	21
Table 2.3 The specifications of Sound Level Meter.....	22
Table 2.4 Comparison between OSHA and ACGIH and NIOSH	23
Table 2.5 Permissible Exposure Limits	24
Table 4.1 Statistic of noise source for first spot at CNC3	44
Table 4.2 Statistic of noise source for second spot at CNC3.....	45
Table 4.3 Statistic of noise source for third spot at CNC3	47
Table 4.4 Statistic of noise source for fourth spot at CNC12	48
Table 4.5 Statistic of noise source for first spot at CNC3	50
Table 4.6 Noise level at every point for idle condition.....	51
Table 4.7 Table of noise level monitoring at the idle time	53
Table 4.8 The noise level for machine CNC12.....	54
Table 4.9 Statistic table for CNC12.....	55
Table 4.10 Table for 25cm calculation Average Noise	57
Table 4.11 The noise level for machine CNC12.....	58
Table 4.12 Statistic table for CNC12.....	59
Table 4.13 Table for 5cm calculation Average Noise	61
Table 4.14 Table for noise level at the technician point.....	62
Table 4.15 Statistic for noise level at CNC5 at the technician point	65
Table 4.16 Comparison between two different conditions of noise level at spot of noise	66

LIST OF FIGURES

Figure 1.1 Hierarchy of Control of Occupational Safety and Health Professional	2
Figure 1.2 Project Flow Chart.....	5
Figure 2.1 Generation of Sound Wave	8
Figure 2.2 Comparison between sound pressure and sound pressure level.....	9
Figure 2.3 Comparison between sound power level in dB and sound power in Watts	10
Figure 2.4 Wavelength.....	14
Figure 2.5 Longitudinal or compression wave for sound	14
Figure 2.6 Beat Frequency	15
Figure 2.7 Bandwidth.....	18
Figure 2.8 Heavy Data Logging Sound Level Meter.....	22
Figure 3.1 Layout at CNC Machine room area.....	28
Figure 3.2 Methodology flow chart	29
Figure 3.3 Sound Level Meter	30
Figure 3.4 SE323 Sound level meter software.....	30
Figure 3.5 Flowchart to determine the source of noise.....	32
Figure 3.6 Layout for the idle noise measurement	33
Figure 3.7 Flowchart of noise level monitoring.....	35
Figure 3.8 Sound level meter attached to the camera tripod.....	36
Figure 3.9 Layout to monitoring noise level.....	36
Figure 3.10 Position of sound level meter	37
Figure 4.1 Noise source at first spot for CNC3	41
Figure 4.2 Noise source at second spot for CNC6.....	41
Figure 4.3 Noise source at third spot for CNC9	42
Figure 4.4 Noise source at fourth spot for CNC14	42
Figure 4.5 Noise source for first spot at CNC3	43
Figure 4.6 Graph of noise source for first spot at CNC3	44
Figure 4.7 Noise source for second spot at CNC3.....	44
Figure 4.8 Graph of noise source for second spot at CNC3	45
Figure 4.9 Noise source for third spot at CNC3	46

Figure 4.10 Graph of noise source for third spot at CNC3	46
Figure 4.11 Noise source for fourth spot at CNC12	47
Figure 4.12 Noise source for fourth spot at CNC12	48
Figure 4.13 Noise source for fifth spot at CNC10	49
Figure 4.14 Graph of noise source for fifth spot at CNC10.....	50
Figure 4.15 Noise monitoring at the idle time	52
Figure 4.16 Noise level mapping	52
Figure 4.17 Noise level graph for CNC12	55
Figure 4.18 Graph for noise level for each machine at 25cm	56
Figure 4.19 Noise level mapping at the distance 25cm	56
Figure 4.20 Noise level graph for CNC12	59
Figure 4.21 Graph for noise level for each machine at 5cm	60
Figure 4.22 Noise level mapping at the distance of 5cm	60
Figure 4.23 Noise level at the technician point.....	63
Figure 4.24 Noise level mapping at the technician point.....	63
Figure 4.25 Highest noise level CNC5	64

LIST OF SYMBOLS

P_a	Pascal
P_O	Reference Pressure
L_P	Sound Pressure Level
W	Watts / Sound Power / Acoustic Sound Power
L_W	Pressure Power Level
W_{RE}	Reference Sound Pressure
I	Acoustical Power
A	Surface Area
L_1	Sound Intensity Level
I_O	Reference Intensity
f	Frequency
t	Time
Hz	Hertz
λ	Wavelength
C	Speed Of Sound
L_P	Level Pressure
f_z	Upper Band-Edge Frequency
f_l	Lower Band-Edge Frequency

LIST OF ABBREVIATIONS

dB	Decibel
WHO	World Health Organization
ISO	International Standard
PPE	Personal Protective Equipment
CNC	Computer Numerical Controlled
SBP	Systolic Blood Pressure
SLM	Sound Level Meter
ISLM	Integrating Sound Level Meter
LCD	Liquid Crystal Display
TWA	Time Weighted Average
PEL	Permissible Exposure Limit
ACGIH	American Conference of Government Industrial Hygienist
OSHA	Occupational Safety and Health Administration
NIOSH	National Institute for Occupational Safety And Health
NIHL	Noise Induce Hearing Loss
HPD	Hearing Protection Devices
SPL	Sound Pressure Level

CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

Occupational noise has only recently been widely acknowledged as a potentially serious health problem (Hassall, Zaveri, & Phill, 1988). Noise is the most significant health hazard to the working population in terms of the number of people affected has been recognized by the World Health Organization (WHO). There is many method used in many industries to avoid the harmful noise. The noise induced hearing loss is the most cases damage accumulates over time. Therefore, the goal of any noise-control programme should be to reach a level of no more than 85 dB (A) (Hansen.C, 2005).

Figure 1.1 shows the hierarchy of control which is created to determine how to implement feasible and effective controls. To eliminate the source of hazardous noise is the most preferred approach cases. However, if the elimination is not possible, substitution of the loud equipment to quieter equipment is the best alternative to protect workers from hazardous noise.

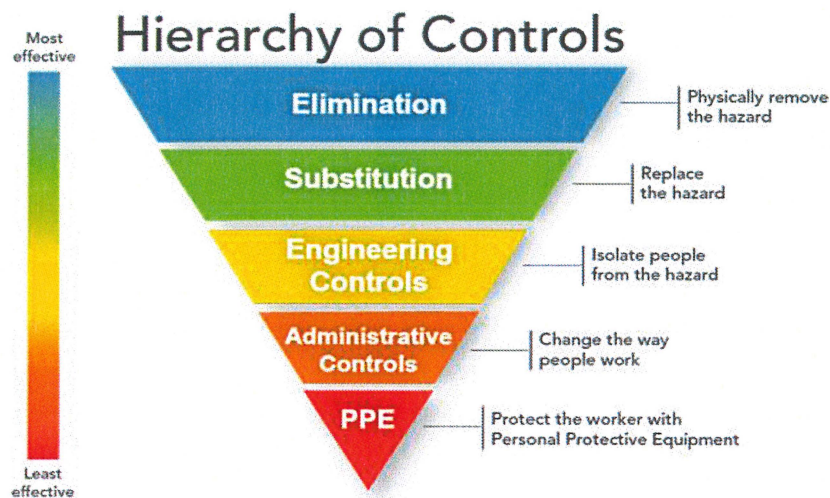


Figure 1.1 Hierarchy of Control of Occupational Safety and Health Professional

Source: <http://www.cdc.gov/niosh/topics/noisecontrol/default.html>

In ISO 11690/2 (1996) has a detail on noise control measures which is state that any noise problem may be described in terms of a sound source, a transmission path and a receiver. The noise control may take the form of altering any one or all of these elements. The cost of effectiveness and acceptability, experience puts modification of the source well ahead of either modification of the transmission path or the receiver. On the other hand, in existing facilities the last two may be the only feasible options (Hansen.C, 2005).

To determine the noise exposure, the sound pressure level is measured. There is various technique and instruments may be used to determine the noise especially in workplace. However, the choice depends on the workplace noise and the information needed. There are several things to consider when planning noise measurement such as the purpose of measurement. The purposes of measurement for the TT Electronics is hearing loss prevention, noise control and community annoyance. This is because, the range of noise is 100dB (A) to 120dB (A). The second purpose is the location of exposed person towards the noise. There is not all the machine in CNC Machine area produce the high noise because there are different model of stripping machine.

CNC is a generic term which can be used to describe many types of device such as plotters, vinyl cutters, 3D printers, milling machines and others. CNC stands for Computer Numerically Controlled and basically means that the motion and function of a machine are controlled by a program that contains coded alphanumeric data (Lan, C. H., & Lan, T. S. (2005). The physical movements of the machine are controlled by instructions, such as coordinate positions that are generated using a computer and the motion of the workpiece or tool, input of parameter which is depth of cut, feed rate, and speed. The function of CNC are turning coolant on/off, turning spindle on/off. CNC is widely used for lathe, drill press, milling machine, grinding unit, sheet-metal press working machine and stripping machine.

1.2 PROBLEM STATEMENT

Several workers undergoing specific tasks in this TT Electronic were observed to be working in high noise zones. They may be exposed to noise levels exceeding equivalent continuous sound level of 85dB (A) or daily noise dose which is set as the action level in Malaysia (Factories and Machinery (Noise Exposure) Regulations, 1st February 1989). Some of the high noise area are identified were from the air compressor and CNC Machine area. Therefore, CNC Machine area noise are now shown the range 100dB (A) to 120dB (A). Within the range that the noise are produce in CNC Machine, the workers are need to wear a proper Personal Protective Equipment (PPE) especially earmuffs to cover their hearing. In additional, the high noise also causes the behavioral effect and physiological effect for the workers.

1.3 OBJECTIVE

1. To monitor the highest noise level produce at CNC Machine area.
2. To identify the source of noise at CNC Machine area based on monitoring data.

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